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Indian Standard

**SAFETY REQUIREMENTS IN
ELECTRO-HEAT INSTALLATIONS**

**PART II PARTICULAR REQUIREMENTS FOR
RESISTANCE HEATING EQUIPMENT**

**Section I Protection in Direct Resistance
Heating Installations**

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SAFETY REQUIREMENTS IN ELECTRO-HEAT INSTALLATIONS

PART II PARTICULAR REQUIREMENTS FOR RESISTANCE HEATING EQUIPMENT

Section I Protection in Direct Resistance Heating Installations

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Indian Standard

SAFETY REQUIREMENTS IN ELECTRO-HEAT INSTALLATIONS

PART II PARTICULAR REQUIREMENTS FOR RESISTANCE HEATING EQUIPMENT

Section I Protection in Direct Resistance Heating Installations

0. FOREWORD

0.1 This Indian Standard (Part II/Sec 1) was adopted by the Indian Standards Institution on 25 January 1979, after the draft finalized by the Industrial Electroheating Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard forms Section 1 of Part II covering the requirements for protection in direct resistance heating installations. The other parts of this series are as follows:

Part I General requirements

Part II Particular requirements for resistance heating equipment

Sec 2 Protection in indirect resistance heating installations

Sec 3 Protection in potassium and sodium nitrate and nitrite bath furnaces

Sec 4 Protection in installations used for drying varnishes and other similar products

Part III Particular requirements for mains and medium frequency induction furnace installations

Part IV Particular requirements for arc furnace installations

0.3 In preparing this standard considerable assistance has been derived from IEC Pub 519-2 (1975) ' Safety in electro-heat installations: Part II Particular requirements for resistance heating equipment ' issued by International Electrotechnical Commission.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS: 2-1960*. The number of significant places retained in

*Rules for rounding off numerical values (revised).

the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 The particular requirements laid down in this standard apply to equipment for the direct resistance heating of a charge or of an enclosure surrounding the latter and should they not be covered by existing requirements, they apply among others to:

- a) salt-bath furnaces with electrodes;
- b) melting furnaces;
- c) equipment for direct heating of solids and of components (such as rivets, wires, pipes, rolled billets) with the exception of welding equipment; and
- d) furnaces with electrodes for glass and slag melting.

NOTE — The present particular requirements do not apply to certain specific types of furnaces such as certain graphitizing furnaces and silicon carbide furnaces.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Electrodes — Elements which directly transfer electric current to the material to be heated. They are in contact with this material.

2.2 Slag Melting Furnaces — Equipment in which the melting and heating-up of slag are carried out by heat generated by a direct flow of the alternating current in the bath between immersed electrodes; the heating can be started by means of an electric arc.

2.3 Glass Melting Furnaces — Equipment in which the melting and heating-up of glass are carried out by heat generated by a direct flow of the alternating current in the bath between immersed electrodes.

2.4 Salt-Bath Furnace with Electrodes — Equipment in which the heating of the charge is carried out by immersion of the latter in a liquid medium at working temperature, the heat being generated by a direct flow of the alternating current in the bath between electrodes.

2.5 Equipment for Direct Resistance Heating of Manufactured Components — Equipment in which the current passes through the material to be heated, for example, devices for heating rivets, machines for hot upsetting, equipment for heating wires, pipes and rods.

2.6 Device for Starting Heating — Auxiliary device which, in the case of salt baths, permits the starting of the process of current flow between main electrodes.

2.7 Contact Heads, Contact with Treated Component — Elements transferring the current to the material to be heated (for example, contact rollers in direct heating equipment).

3. CONSTRUCTION AND INSTALLATION DETAILS

3.1 Voltage Values — In equipment which is not protected, in normal operation, against accidental direct contact — this being the general case — it is required that direct resistance heating equipment shall not be operated at rated voltages exceeding 50 V. The voltage energizing salt-bath furnaces with electrodes shall also be maintained below 50 V.

3.2 Absorbed Power (Tolerance) — In the case of salt-bath furnaces, slag melting furnaces and glass melting furnaces, the variation of the bath resistivity is to be taken into account when selecting distribution equipment, protection devices and energizing conductors.

3.3 Nameplates — For salt-bath furnaces with electrodes and equipment for direct heating of materials, supplied by a separate voltage source (transformer or generator), the nameplate shall designate, in addition to the rated power of the equipment, the following values:

- a) Rated current;
- b) Rated voltage;
- c) Capacity of the power source and if the furnace is fed by a transformer, the primary and secondary voltages; and
- d) Working temperature.

4. OPERATION

4.1 Protection Against Accidental Contacts — Operating instructions shall state that during loading and unloading, heating elements of salt-bath furnaces with electrodes shall be handled only in the dead state (this is also valid for equipment operated at rated voltages below 50 V).

4.2 Other Protective Measures

4.2.1 In equipment for the direct heating of materials and components, measures shall be taken to eliminate any hazards liable to be caused by sparking of particles in the vicinity of such equipment.

4.2.2 The same is valid for salt-bath furnaces when auxiliary electrodes are used.